Final Precursor Analysis

Accident Sequence Precursor Program --- Office of Nuclear Regulatory Research

Surry Units 1 & 2	Unanalyzed Condition Related to Loss of RCP Seal Cooling During an Appendix R Fire Event	
Event Date: 11/03/2003	LER 280/03-005	ΔCDP = 1×10^{-6}

June 29, 2005

Condition Summary

During the fire protection inspection conducted January 24-31, 2003 and February 10-14, 2003, the NRC inspectors determined that the licensee's fire response procedures were not effective in assuring a safe shutdown of Unit 1 or Unit 2 during a severe fire in ESGR No. 1 or ESGR No. 2. These procedures may not preclude an extended loss of reactor coolant pump seal injection flow and may initiate a reactor coolant pump seal LOCA which could result in pressurizer level failing to be maintained within the indicating range as required by 10 CFR 50, Appendix R.

The licensee's analysis describes the means by which safe shutdown could be achieved in the event of fire on Unit 1 or Unit 2 to meet the requirements of Appendix R. Alternative shutdown capability independent of the existing cabling and equipment was intended to be provided for plant locations which did not meet the requirements of Section III.G.2 of Appendix R. The licensee's analysis identified a minimum set of plant systems and components necessary for achieving the safe shutdown performance goals. One of the minimum required systems was the charging and volume control system which would be used to provide makeup water to the RCS. This would be accomplished by aligning the charging system through two separate and independent flow paths: the injection lines to the RCP seals, and the normal charging line to the loop 2 cold leg.

The Surry charging pump discharge headers are cross-connected between units through a normally isolated line. In the event that one unit's charging pumps are incapacitated due to fire, the opposite unit's charging pumps could be used to provide charging to the fire-affected unit's RCS through the cross-connect piping. Local manual operator action would be required to make this alignment. The Appendix R analysis is based on reestablishing charging flow via the cross-connect within 70 minutes. This time frame would ensure that pressurizer level would be maintained within the normal operating band until reactor makeup flow was reestablished. This time frame was based on the need to only supply sufficient reactor makeup flow to compensate for normal RCP seal leakage, not the need to mitigate RCS leakage in excess of 125 GPM as might occur during an RCP seal LOCA. In certain fire scenarios, charging pump flow could be temporarily lost; hence, RCP seal injection flow to the fire-affected unit would be temporarily lost as well. The analysis failed to evaluate the potential adverse effect on the RCP seal packages due to the delay (20-25 minutes) in establishing charging system cross-connect with the unaffected unit as well as the potential adverse effect of restoring seal injection flow following a prolonged loss of seal injection.

The Unit 2 charging system, through an existing cross-connect, is credited to provide charging flow and seal injection if the Unit 1 charging system is rendered inoperable. Because of the fire procedure's implementation structure, fire damage could result in a loss of seal injection and normal charging flow for a period in excess of 20 minutes before cross-connect would be aligned. Industry issued guidance, [Westinghouse Emergency Response Guideline (ERG) Direct Work Request No. DW-94-011, dated December 12, 1996], determined that reestablishing seal injection or restoring CCW to the thermal barrier heat exchangers would not be appropriate if all seal cooling had been lost long enough [about 13 minutes] that the maximum RCP seal parameters identified in the RCP Vendor Manual were exceeded. This was to prevent unintended consequences that could result in additional pump damage or failure of plant safety systems [specifically CCW]. In lieu of reestablishing RCP seal injection or CCW thermal barrier cooling, the Westinghouse guidance stated that seal cooling should be restored by cooling the RCS which would reduce the temperature of the water flowing through the pump seals.

The licensee issued an LER on this condition. The LER is given as Reference 3.

Analysis Results

- **Importance**[1]

The total importance was calculated to be 1.0 x 10^{-6}.

The Accident Sequence Precursor Program acceptance threshold for condition assessment is an importance (ΔCDP) of 1 x 10^{-6}. The importance of the condition assessment for this event is at the precursor threshold. Considering the uncertainties associated with operator actions for recovery of the damaged bus (in scenario 5, and the operator actions to cross connect to the second unit, and other uncertainties associated with the fire and SBO scenarios, the event is retained in the ASP database.

- **Dominant sequences**

The condition importance is calculated for the sum of three dominant fire scenarios. The exposure time of one year is used for calculation of the condition importance. The results are summarized below.

[1]For the condition assessment, the parameter of interest is the measure of the incremental increase between the conditional probability for the period in which the condition existed and the nominal probability for the same period but with the condition nonexistent and plant equipment available. This incremental increase or "importance" is determined by subtracting the CDP from the CCDP. This measure is used to assess the risk significance of hardware unavailabilities especially for those cases where the nominal CDP is high with respect to the incremental increase of the conditional probability caused by the hardware unavailability.

Scenario		**Init E. Frequency**	**CDF base**	**CDF cond**	**Scenario Importance**
# 3	Water Spray on both Buses - Room 1H	9.5E-07	1.2E-07	7.9E-07	6.7E-07
# 4	Water Spray on both Buses - Room 1J	6.2E-08	8.1E-09	5.1E-08	4.3E-08
# 5	Severe Fire in Switchgear Room 1J	8.4E-05	1.8E-06	2.1E-06	2.9E-07
	Sum =	8.5E-05	1.9E-06	2.9E-06	1.0E-06

- Modeling Assumptions

- **Assessment summary**

This event was modeled as a condition assessment. The condition existed over a period of multiple years. The condition assessment was run for 8,760 hours, per ASP rules.

- **Key Modeling Assumptions**

  - The fire sequences that are already identified in a previous NRC assessment are used. These scenarios are developed in detailed fire analyses which take into account of the actual equipment in the fire area of interest. The scenarios are developed using standard fire analysis techniques. The frequencies of the scenario analyses are used in the current ASP analysis, and are supplemented with the base and condition CCDPs calculated in this analysis to estimate the condition importance. The previous NRC analyses referred to in this paragraph are proprietary material, thus their details are not given here, but they exist as attachments to Reference 1.

  - The fire scenarios identified lead to loss of AC power on both buses. This is modeled as loss of offsite power (LOOP) and station blackout event (SBO). In these scenarios, it is assumed that the operators first will go into the appropriate emergency response procedures for the SBO event, which is the immediate and major concern. The establishment of charging flow from the second unit taking up to 70 minutes to be implemented with local operator actions will be a later and secondary activity.

  - The “current Case” for ASP analysis is the SBO event with the fire scenario frequency and boundary conditions. No credit or penalty is modeled for cooling the RCP seals with the unit 2 charging system water in the long term; the operators will be already in the SBO emergency guidelines, cooling the RCS with

rapid cooldown, which also indirectly cools the RCP seals, as recommended by the vendor.

- The base case had to be defined in this analysis for this issue, since it does not yet exist. Namely, the plant remedy to comply with the Appendix R in this case is not given. The base case is defined as a solution that will allow the operators to provide cooling water to the seals within the 13 minute period to avoid seal LOCA concern (this can be realistically by automatic actuation from the control room; it would be more difficult to justify the credibility of local actions in such as short time frame). This will provide the “best solution”, namely the lowest CDF, and allow us to calculate the highest (conservative) condition importance.

- If the operators later choose to cool the RCP seals after first following the SBO procedures and then establishing cross connect to the second unit, the effect on the RCP seals is unanalyzed (unknown; not studied elsewhere). At that time the RCS pressure and temperature will be considerably lower than at power (due to previous implementation of rapid cooldown per SBO procedures). In the current analysis, no attempt is made to credit or penalizes the plant in case of such a scenario. In fact, if SBO procedures are followed, there is no reason to reestablish seal cooling after cross-connect is implemented.

Calculation of Condition Importance

1.0 Scenario definition and Frequency

Reference 1 analyzed the condition in detail and identified three fire scenarios of consequence, due to loss of both emergency buses 1J and 1H. The condition importance of these three scenarios are analyzed here, using the ASP analysis techniques, and the plant SPAR model, whenever applicable.

The three scenarios are as follows:

Fire Scenario 5. Severe Fire in Switchgear Room 1J which is assumed to cause loss of emergency bus 1J, loss of offsite power and damage to two sets of cable trays above the electrical cabinets. It is also assumed that emergency bus 1H would be lost, but can be recovered through manual actions from the switchgear room. The scenario frequency considering various equipment and their locations, fire severity factor, non-suppression probability is calculated to be F(5) = 8.4E-05/yr. This frequency is dominated by electrical cabinet fires.

Fire Scenario 3. Water Spray on Both Buses - Room 1H. The Halon system is the primary means for suppressing a sever fire in the ESGR. However, water hoses will be employed in case gas based systems fail to extinguish the fire completely. The frequency of this scenario for switchgear room 1H is calculated as F(3) = 9.5E-07/yr. Although the frequency of this fire scenario is relatively small, it is postulated to fail both emergency buses, and the failure is not recoverable in the mission time of interest.

Fire Scenario 4. Water Spray on Both Buses - Room 1J. This scenario is the same as scenario 4. The scenario frequency is F(4) = 6.2E-08/yr.

Other scenarios are screened out in Reference 1.

In all three scenarios, the turbine-driven AFW pump is potentially available; the reactor will be tripped; SBO conditions will be present; the TD-AFW pump will automatically start. The operators will attempt to recover AC power to at least of bus (this is not feasible in scenarios 3 and 4). In parallel, the fire will be dealt with and extinguished.

Although the frequencies of scenarios 3 and 4 are less than 1E-06/yr, they are still analyzed since their CCDPs may be relatively high and the sum of all scenario CDPs may add up to result in an event importance above 1E-06.

2.0 Calculation Process

The current plant condition and a base plant condition are defined and the condition importances are calculated as follows (1 year exposure time is used for calculation of condition importance):

1. For each scenario, calculate the conditional core damage probability once for the conditional case, and once for the base case, given that the fire scenario occurred. These CCDPs are labeled as CDP(i)base and CDP(i)conditional, where I stand for the scenario number.

2. The scenario importance is calculated as:

   SI(i) = F(i) * (CDP(i)condition - CDP(i)base) * 1 yr. Equation 1

3. The condition importance is calculated by summing the scenario importances:

   CI = SI(3) + SI(4) + SI(5) Equation 2.

3.0 Calculation of Importance of Scenario 5

3.1 The Conditional Case

The severe fire in scenario 5 is assumed to lead to an effective station blackout condition, with bus 1J non-recoverable, and bus 1H may be recoverable with local operator actions. Since the event rapidly turns into an SBO, the operators are expected to follow the SBO emergency procedures first and foremost, including rapid cooldown of RCS. Once the plant conditions are stabilized, the operators are expected to pursue local recovery actions to cross tie into the second unit's charging system, within the 70 minutes time window specified. In the meantime, they will attempt to recover the emergency buses (only 1H is potentially recoverable in this scenario). The plant SPAR success criteria requires HPI injection to avoid core damage in this event tree. If only charging flow from the second unit is available, and no consequential RCP seal LOCA exists, this water source should provide sufficient RCS makeup. However, if RCP seal LOCA of some magnitude exists, this flow may not be sufficient. For the purposes of this analysis, it is assumed that for the current case, HPI is needed, as specified in the SPAR model, and the charging pump from the second unit will not be sufficient. This is conservative at least 20% of the cases where there is no RCP seal LOCA. However, an operator action of 1H bus recovery is already credited in this scenario; a second potential recovery with unit 2 cross connect, in case there is no seal LOCA is not modeled. The operators are most likely to concentrate on SBO emergency guidelines and bus recovery.

Thus the current case is defined as a fire-induced SBO, with potential recovery of 1H bus, and non-recoverable failure of 1J bus.

There is neither credit nor penalty given for the operators potentially providing seal cooling to the RCP pumps in the long term, after establishing charging pump flow from the second unit. If a seal LOCA has already occurred, this would not help; if the seal LOCA did not occur, than this would put the seals in unanalyzed conditions (against the vendor recommendation). Since the operators are already following SBO procedures in this particular scenario, with rapid RCS cooldown (which provides slow cooling to the seals), they are not expected to deviate from the procedure they are already in.

The basic events used to define the current case through a SAPHIRE change set are as follows:

Set all IE-XXX frequencies to zero, except IE-LOOP, which is set equal to 1.

Event	Prob/Freq	
ACP-BAC-LP-1J	True	Fails bus 1J
EPS-DGN-TM-DG1	True	Causes SBO
EPS-DGN-TM-DG2	True	Causes SBO
EPS-DGN-TM-DG3	True	Causes SBO
EPS-DGN-TM-SBO	True	Causes SBO
EPS-XHE-XL-NR01H	True	Prevents recovery of Power via EDG
EPS-XHE-XL-NR02H	True	Prevents recovery of Power via EDG
EPS-XHE-XL-NR03H	True	Prevents recovery of Power via EDG
EPS-XHE-XL-NR04H	True	Prevents recovery of Power via EDG
OEP-XHE-XL-NR02H	0.02	Allows recovery of Power to 1H bus
OEP-XHE-XL-NR03H	0.02	Allows recovery of Power to 1H bus
OEP-XHE-XL-NR04H	0.02	Allows recovery of Power to 1H bus

OEP-XHE-XL-NR01H is left at its nominal value of 0.5.

The HEP for Bus 1H recovery is calculated in Appendix A, using SPAR-H process.

The SPAR run (named TEST-2) provides the CCDP for this case:

CDP(5)conditional = 0.025.

The cutsets of this analysis are given in Appendix B, Table B-1.

3.2 The Base Case

Since the compliance configuration/procedures for the plant are not defined, the base case does not formally exist, but is defined in this analysis to proceed with the condition importance calculation.

The base case is defined as a potential compliance process in which the plant provides rapid seal cooling capability (within the 13 minute period) to avoid the potential seal leakage.(A more conservative base case would have been a compliance strategy that will reduce the CDP(5)base to “zero”.   This would have maximized the importance of the condition.)   The basic events that are changed by the SAPHIRE “change set” are as follows:

Event	Prob/Freq	
ACP-BAC-LP-1J	TRUE	Fails bus 1J
EPS-DGN-TM-DG1	TRUE	Causes SBO
EPS-DGN-TM-DG2	TRUE	Causes SBO
EPS-DGN-TM-DG3	TRUE	Causes SBO
EPS-DGN-TM-SBO	TRUE	Causes SBO
EPS-XHE-XL-NR01H	TRUE	Prevents recovery of Power via EDG
EPS-XHE-XL-NR02H	TRUE	Prevents recovery of Power via EDG
EPS-XHE-XL-NR03H	TRUE	Prevents recovery of Power via EDG
EPS-XHE-XL-NR04H	TRUE	Prevents recovery of Power via EDG
OEP-XHE-XL-NR02H	0.02	Allows recovery of Power to 1H bus
OEP-XHE-XL-NR03H	0.02	Allows recovery of Power to 1H bus
OEP-XHE-XL-NR04H	0.02	Allows recovery of Power to 1H bus
RCS-MDP-LK-BP1	FALSE	Does not allow RCP seal Leak
RCS-MDP-LK-BP2	FALSE	Does not allow RCP seal Leak
RCS-MDP-LK-O1	FALSE	Does not allow RCP seal Leak
RCS-MDP-LK-O2	FALSE	Does not allow RCP seal Leak

OEP-XHE-XL-NR01H is left at its nominal value of 0.5.

The HEP for Bus 1H recovery is calculated in Appendix A, using SPAR-H process.

The SPAR run (named TEST-3) provides the CCDP for this case:

CDP(5)base = 0.0215.

The cutsets of this analysis are given in Appendix B, Table B-2.

3.3 Scenario Importance

The scenario importance is calculated as:

SI(5) = F(5) * (CDP(5)condition - CDP(5)base) * 1 yr.   Equation 1

SI(5) = 8.4E-05/yr * (2.5E-02 - 2.15E-02) * 1 yr   = 2.9E-07

4.0 Calculation of Importance of Scenario 3

4.1 The Conditional Case

In this scenario, the plant is in SBO and there is no recovery of AC power on either bus. Thus, if there is RCP seal LOCA, core damage will occur (since HPI is needed for success per SPAR model). If there is no RCP seal LOCA, and AFW is operational, and the cross connect to the second unit occurs (for RCS makeup), success is postulated (as in Reference 1). Since there is no recovery of buses, the operators can concentrate SBO procedures and cross connect to second unit. The conditional core damage probability in this case is estimated as 0.13 in Reference 1 due to the following failure modes:

failure to establish cross connect with unit 2; OR
failure of TD AFW; OR
failure to maintain makeup integrity.

This failure probability is also used in the current analysis[2]. It is assumed that there is 0.20 chance that no RCP seal LOCA will occur and 0.80 chance that RCP seal LOCA will occur. This fraction is taken from WOG-2000 RCP seal model (Reference 2), with no additional credit for floating ring seals in this plant.

Thus the conditional core damage probability can be calculated as:

CDP(3)conditional = 0.2 * 0.13 + 0.8 * 1.0 = 0.83

4.2 Base Case

The base case is defined as in scenario 5 with no seal LOCA. The base damage probability is given as:

CDP(3)base = 0.13.

4.3 Scenario Importance

The scenario importance is calculated as:

SI(3) = F(3) * (CDP(3)condition - CDP(3)base) * 1 yr. Equation 1

SI(3) = 9.5E-07/yr * (0.83 - 0.13) * 1 yr = 6.7E-07

[2] The calculation for this failure probability is examined and the result is deemed to be numerically appropriate to be used in the current analysis.

5.0 Calculation of Importance of Scenario 4

Calculation of scenario 4 importance is the same as scenario 3, expect with a different scenario frequency:

The scenario importance is calculated as:

SI(4) = F(4) * (CDP(4)condition - CDP(4)base) * 1 yr. Equation 1

SI(4) = 6.2E-08/yr * (0.83 - 0.13) * 1 yr = 4.3E-08

6.0 Condition Importance

The condition importance is the sum of the importances of the scenarios associated with the condition. The condition importance is calculated as

CI = SI(3) + SI(4) + SI(5) Equation 2

CI = 6.7E-07 + 4.3E-08 + 2.9E-7 = 1.0E-06.

Summary of Calculations:

	Scenario	**Init E. Frequency** (1)	**CDP base** (2)	**CDF base** (3)	**CDP cond** (4)	**CDF cond** (5)	**Scenario Importance** (6)
# 3	Water Spray on both Buses - Room 1H	9.50E-07	1.30E-01	1.24E-07	8.30E-01	7.9E-07	6.7E-07
# 4	Water Spray on both Buses - Room 1J	6.20E-08	1.30E-01	8.06E-09	8.30E-01	5.1E-08	4.3E-08
# 5	Severe Fire in Switchgear Room 1J	8.40E-05	2.15E-02	1.81E-06	2.50E-02	2.1E-06	2.9E-07
	Sum =	8.50E-05		1.90E-06		2.90E-06	1.0E-06

(3) = (1) * (2)
(5) = (1) * (4)
(6) = {(5) - (3) } * (1 year)

References

1. NRC Letter EA-04-005, *Final Significance Determination for White Findings and Notice of Violation (NRC Inspection Report No. 05000280/2004008 and 05000281/2004008 Surry Power Station),* dated 9/15/2004 (ADAMS Accession Number ML0426000751, IR280-04-008Att1.pdf).

2. *WOG2000 Reactor Coolant Pump Seal Leakage Model for Westinghouse PWRs*, Selim Sancaktar. WCAP-15603. December 2000.

3. LER 280-03-005: Unanalyzed Condition Related to Loss of RCP Seal Cooling during an Appendix R Fire Event, Surry Power Station Unit 1, issued 12/17/2003.

Appendix A. Human Error Calculations.

The recovery 1H bus after the fire has been put down is a local action. The diagnosis part of the human error probability (HEP) of this action is not dominant since both the fire event and the loss of buses leading to reactor trip provide the cues for course of action. The success of the local operator action (either in the room or the vicinity of the room where the fire has very recently taken place) may be affected mainly by stress and ergonomics. Considerable uncertainty may exist in the value of this HEP. A stress level of 'high" and "poor" ergonomics are assigned to this action. The HEP is calculated as 2*10*0.001 = 0.02. This value is assigned to recovery actions modeled in SBO event, except for the first hour, which is left at its original nominal value of 0.53, which is happens to be also appropriate for this scenario (the bus may or may not be recovered in the first hour).

Thus:

OEP-XHE-XL-NR01H	0.053
OEP-XHE-XL-NR02H	0.02
OEP-XHE-XL-NR03H	0.02
OEP-XHE-XL-NR04H	0.02.

Appendix B. Analysis Output Files from SAPHIRE Runs

This appendix contains the SAPHIRE output files referred to in the main body of the report.

Table B-1 CDP cutsets for CDP(5)current

Table B-2 CDP cutsets for CDP(5)base

Table B-1 CDP cutsets for CDP(5)current

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
1	64.57	1.600E-002	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	2.000E-002
			/RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	8.000E-001
2	80.72	4.000E-003	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	2.000E-002
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
3	84.68	9.800E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			LPI-MDP-TM-1A	LPI MDP TRAIN 1A UNAVAILABLE DUE TO T & M	5.000E-003
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
4	86.34	4.107E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			/PPR-MOV-FC-BLK1	BLOCK VALVE 1535 CLOSED DUE TO PORV LEAKING	7.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-1	PORV 1 FAILS TO RECLOSE AFTER OPENING	3.000E-003
5	88.00	4.107E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			/PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	7.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-2	PORV 2 FAILS TO RECLOSE AFTER OPENING	3.000E-003

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
6	88.96	2.352E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			LPI-MDP-FS-1A	LPI MDP TRAIN 1A FAILURES	1.200E-003
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
7	89.77	2.000E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	2.000E-002
			RCS-MDP-LK-BP1	RCP SEAL STAGE 1 INTEGRITY (BINDING/POPPING OPEN) FAILS	1.250E-002
			/RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	8.000E-001
8	90.56	1.960E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
			SWS-MOV-OO-100B	MOV 100B FAILS TO CLOSE	1.000E-003
9	91.36	1.960E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
			SWS-MOV-OO-106C	MOV 106C FAILS TO CLOSE	1.000E-003
10	92.16	1.960E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
			SWS-MOV-OO-106A	MOV 106A FAILS TO CLOSE	1.000E-003
11	92.95	1.960E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
			SWS-MOV-OO-100D	MOV 100D FAILS TO CLOSE	1.000E-003
12	93.75	1.960E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			LPI-XHE-XR-MDPA	OPERATOR FAILS TO RESTORE LPI MDP 1A AFTER T & M	1.000E-003
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
13	94.54	1.960E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			LPR-MOV-OO-RWSTA	LPR/RWST ISOL MOV 1862A FAILS	1.000E-003
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
14	95.34	1.960E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			LPR-MOV-CC-1860A	FAILURE OF CONTAINMENT SUMP MOV 1860A	1.000E-003
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
15	96.14	1.960E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			CSR-XHE-XR-FLANGE	TEST FLANGES LEFT BLANKED AFTER 1-PT-17.6 (VALUE FROM PSA)	1.000E-003
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
16	96.55	1.009E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			LPI-MDP-FR-1A	LPR MDP TRAIN 1A FAILS TO RUN	5.149E-004
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
17	96.87	7.929E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FS-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO START	6.000E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
18	97.14	6.607E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-TM-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 TEST AND MAINTENANCE	5.000E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
19	97.37	5.473E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FR-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO RUN	4.141E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
20	97.59	5.281E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			PPR-MOV-FC-BLK1	BLOCK VALVE 1535 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-SR1	FAILURE OF SRV 1 TO RECLOSE	3.000E-003
21	97.81	5.281E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			PPR-MOV-FC-BLK1	BLOCK VALVE 1535 CLOSED DUE TO PORV LEAKING	3.000E-001

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-SR3	FAILURE OF SRV 3 TO RECLOSE	3.000E-003
22	98.02	5.281E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			PPR-MOV-FC-BLK1	BLOCK VALVE 1535 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-SR2	FAILURE OF SRV 2 TO RECLOSE	3.000E-003
23	98.23	5.000E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR02H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 2 HOURS	2.000E-002
			RCS-MDP-LK-BP1	RCP SEAL STAGE 1 INTEGRITY (BINDING/POPPING OPEN) FAILS	1.250E-002
			RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.000E-001
24	98.43	4.900E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			LPI-MDP-TM-1A	LPI MDP TRAIN 1A UNAVAILABLE DUE TO T & M	5.000E-003
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			RCS-MDP-LK-BP1	RCP SEAL STAGE 1 INTEGRITY (BINDING/POPPING OPEN) FAILS	1.250E-002
			/RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	8.000E-001
25	98.52	2.121E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FS-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO START	6.000E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			/OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	4.714E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001

Table B-2 CDP cutsets for CDP(5)base

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
1	93.12	2.000E-002	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	2.000E-002
2	95.04	4.107E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			/PPR-MOV-FC-BLK1	BLOCK VALVE 1535 CLOSED DUE TO PORV LEAKING	7.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-1	PORV 1 FAILS TO RECLOSE AFTER OPENING	3.000E-003
3	96.95	4.107E-004	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			/PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	7.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-2	PORV 2 FAILS TO RECLOSE AFTER OPENING	3.000E-003
4	97.33	7.929E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FS-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO START	6.000E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
5	97.64	6.607E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-TM-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 TEST AND MAINTENANCE	5.000E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
6	97.90	5.473E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
			AFW-TDP-FR-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO RUN	4.141E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
7	98.15	5.281E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			PPR-MOV-FC-BLK1	BLOCK VALVE 1535 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-SR1	FAILURE OF SRV 1 TO RECLOSE	3.000E-003
8	98.40	5.281E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			PPR-MOV-FC-BLK1	BLOCK VALVE 1535 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-SR3	FAILURE OF SRV 3 TO RECLOSE	3.000E-003
9	98.65	5.281E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
			PPR-MOV-FC-BLK1	BLOCK VALVE 1535 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001
			PPR-SRV-CO-SBO	PORVs/SRVs OPEN DURING SBO	3.700E-001
			PPR-SRV-OO-SR2	FAILURE OF SRV 2 TO RECLOSE	3.000E-003

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
10	98.76	2.121E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FS-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO START	6.000E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			/OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	4.714E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001
11	98.85	2.000E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	2.000E-002
			OPR-XHE-XM-RSSDEP	OPERATOR FAILS TO COOLDOWN RCS TO 1720 PSI IN 2 HOURS	1.000E-003
12	98.95	1.903E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FS-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO START	6.000E-003
			AFW-TDP-FS-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO START	6.000E-003
			AFW-XHE-XL-TDPFS	OPERATOR FAILS TO RECOVER AFW TDP (FAILS TO START)	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
13	99.03	1.768E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-TM-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 TEST AND MAINTENANCE	5.000E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			/OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	4.714E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001
14	99.11	1.586E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FS-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO START	6.000E-003
			AFW-TDP-TM-TDP2	AFW TDP UNAVAILABLE DUE TO TEST AND MAINTENANCE	5.000E-003
			OEP-XHE-XL-	OPERATOR FAILS TO RECOVER	5.286E-001

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
			NR01H	OFFSITE POWER IN 1 HOUR	
15	99.19	1.586E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FS-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO START	6.000E-003
			AFW-TDP-TM-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 TEST AND MAINTENANCE	5.000E-003
			AFW-XHE-XL-TDPFS	OPERATOR FAILS TO RECOVER AFW TDP (FAILS TO START)	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
16	99.27	1.464E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FR-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO RUN	4.141E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			/OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	4.714E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001
17	99.33	1.321E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-XHE-XM-XTIE	OPERATOR FAILS TO INITIATE AFW CROSSTIE FLOW	1.000E-003
			AFW-XHE-XO-TDP	OPERATOR FAILS TO CONTROL AFW TDP FLOW GIVEN SBO AND LOSS OF INST. AIR	2.500E-002
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
18	99.40	1.321E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-TM-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 TEST AND MAINTENANCE	5.000E-003
			AFW-TDP-TM-TDP2	AFW TDP UNAVAILABLE DUE TO TEST AND MAINTENANCE	5.000E-003
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
19	99.47	1.313E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FR-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO RUN	4.141E-003
			AFW-TDP-FS-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO START	6.000E-003

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
			AFW-XHE-XL-TDPFS	OPERATOR FAILS TO RECOVER AFW TDP (FAILS TO START)	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
20	99.53	1.313E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FR-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO RUN	4.141E-003
			AFW-TDP-FS-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO START	6.000E-003
			AFW-XHE-XL-TDPFR	OPERATOR FAILS TO RECOVER AFW TDP (FAILS TO RUN)	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
21	99.59	1.095E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FR-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO RUN	4.141E-003
			AFW-TDP-TM-TDP2	AFW TDP UNAVAILABLE DUE TO TEST AND MAINTENANCE	5.000E-003
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
22	99.64	1.095E-005	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FR-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO RUN	4.141E-003
			AFW-TDP-TM-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 TEST AND MAINTENANCE	5.000E-003
			AFW-XHE-XL-TDPFR	OPERATOR FAILS TO RECOVER AFW TDP (FAILS TO RUN)	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
23	99.69	9.800E-006	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			HPR-XHE-XM-1115D	UNDEVELOPED EVENT TO MANUALLY CLOSE 1115D OR ALT ALIGN	1.000E-002
			/OEP-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	9.800E-001
			OPR-XHE-XM-RSSDEP	OPERATOR FAILS TO COOLDOWN RCS TO 1720 PSI IN 2 HOURS	1.000E-003
24	99.74	9.066E-006	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FR-	UNIT 2 AFW TD PUMP 2-FW-P-2	4.141E-003

Cut No.	% Total	Prob./Frequency	Basic Event	Description	Event Prob.
			2FWP2	FAILS TO RUN	
			AFW-TDP-FR-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO RUN	4.141E-003
			AFW-XHE-XL-TDPFR	OPERATOR FAILS TO RECOVER AFW TDP (FAILS TO RUN)	1.000E+000
			OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	5.286E-001
25	99.77	5.091E-006	IE-LOOP	LOSS OF OFFSITE POWER	1.000E+000
			AFW-TDP-FS-2FWP2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO START	6.000E-003
			AFW-TDP-FS-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO START	6.000E-003
			AFW-XHE-XL-TDPFS	OPERATOR FAILS TO RECOVER AFW TDP (FAILS TO START)	1.000E+000
			/OEP-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	4.714E-001
			PPR-MOV-FC-BLK2	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.000E-001